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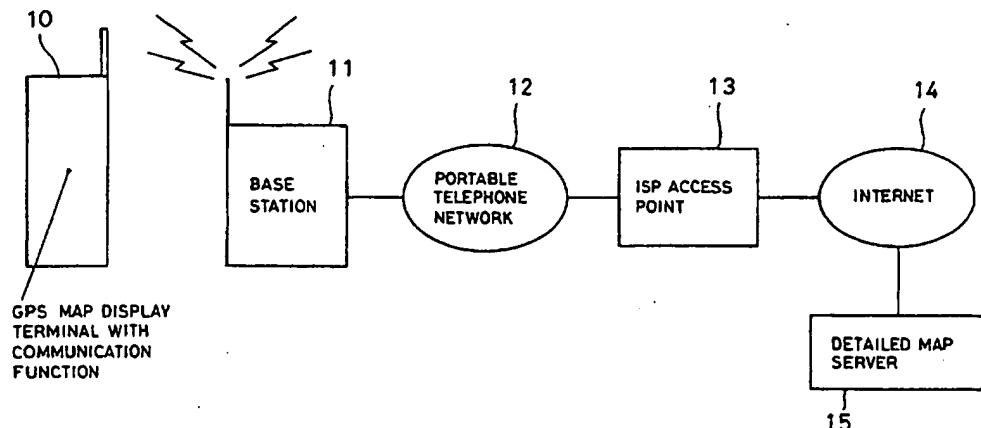
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(54) Abstract Title  
**Map display terminal**

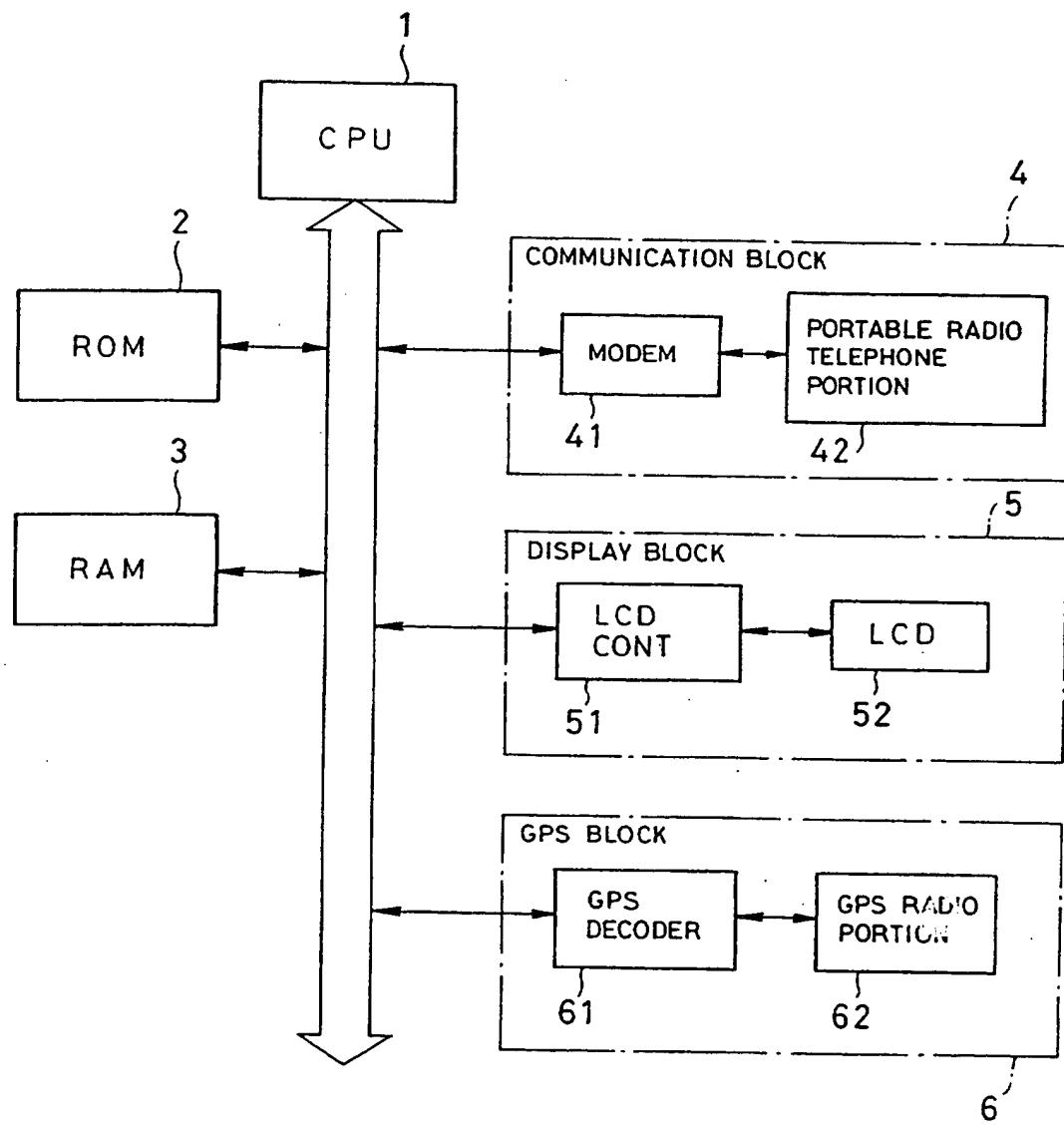
(57) A map display terminal 10, obtains a current position on the basis of a satellite navigation system, and comprises means for displaying a large-scale map depicting a wide area, the map being centred at the current position. Second means are provided for expanding the displayed map step-wise to show increasingly greater detail. The large-scale map data may be stored within the terminal, possibly within a ROM (2, Figure 1), while the device may download the more detailed map data from a remote server 15 via portable telephone network 12. The display may be made more detailed in a step-wise manner, with each decrease in scale to the most detailed level being performed as a function of the amount of data downloaded from the remote server (Figure2). The display may be part of a portable communication terminal 10.

FIG. 4

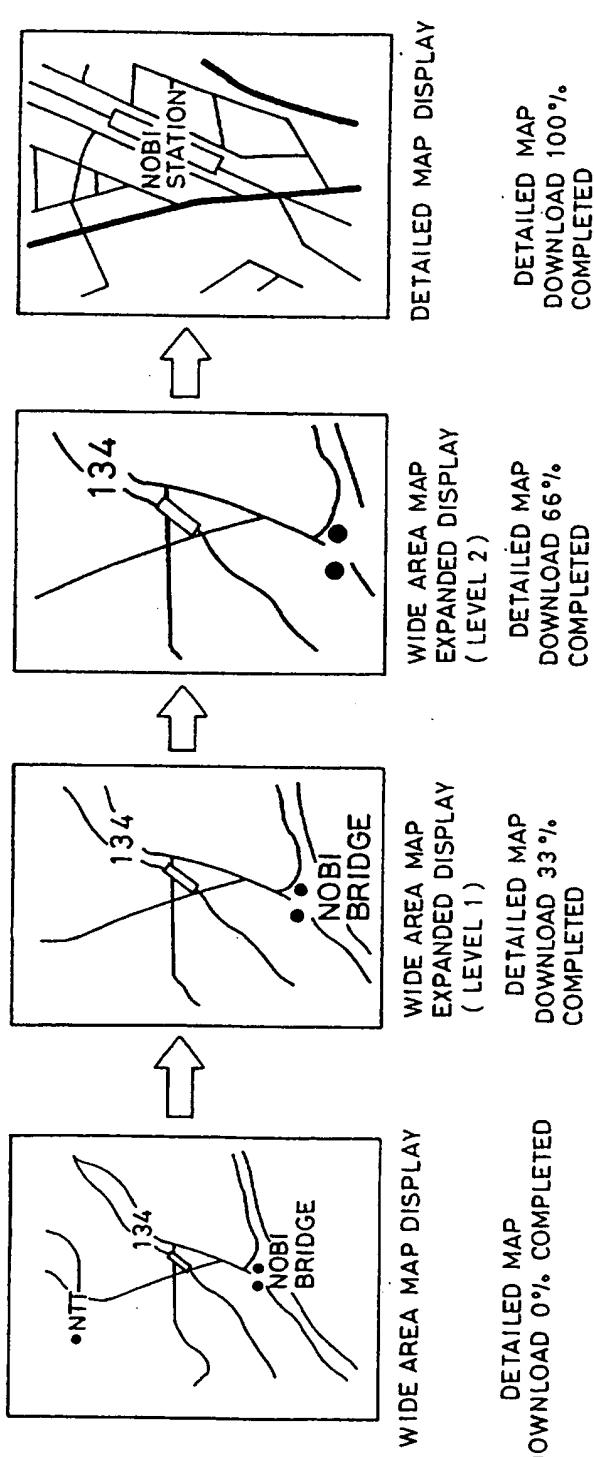


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FIG.1

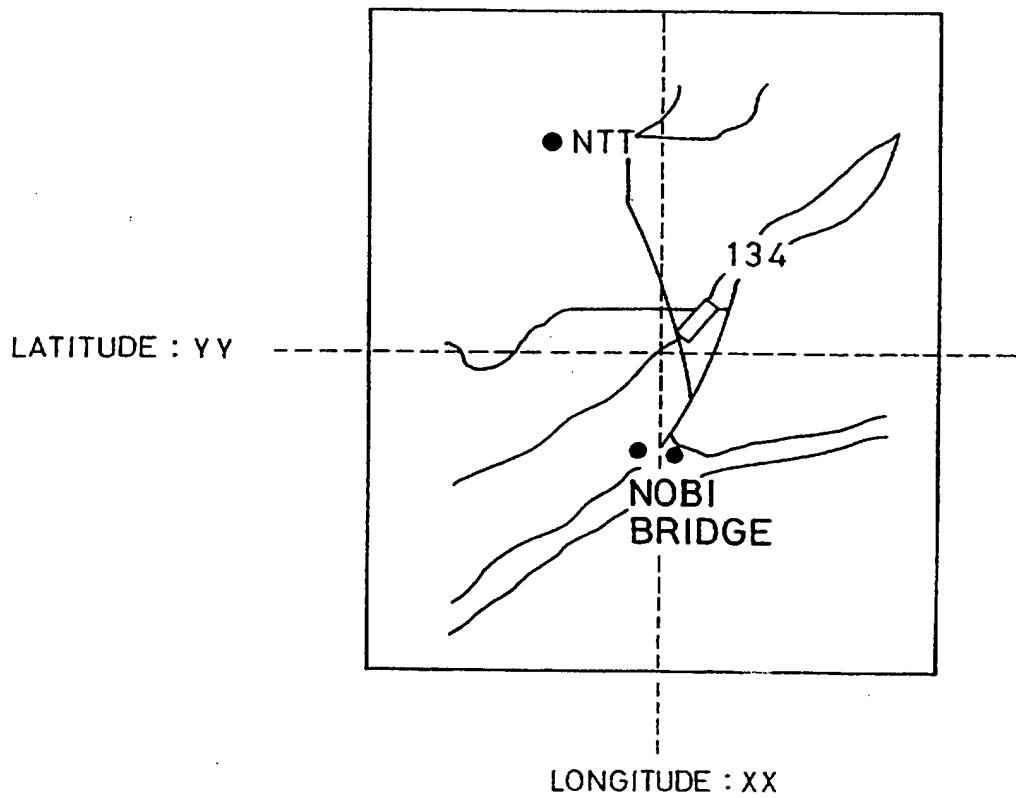


**FIG. 2**



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## FIG. 3



**FIG. 4**

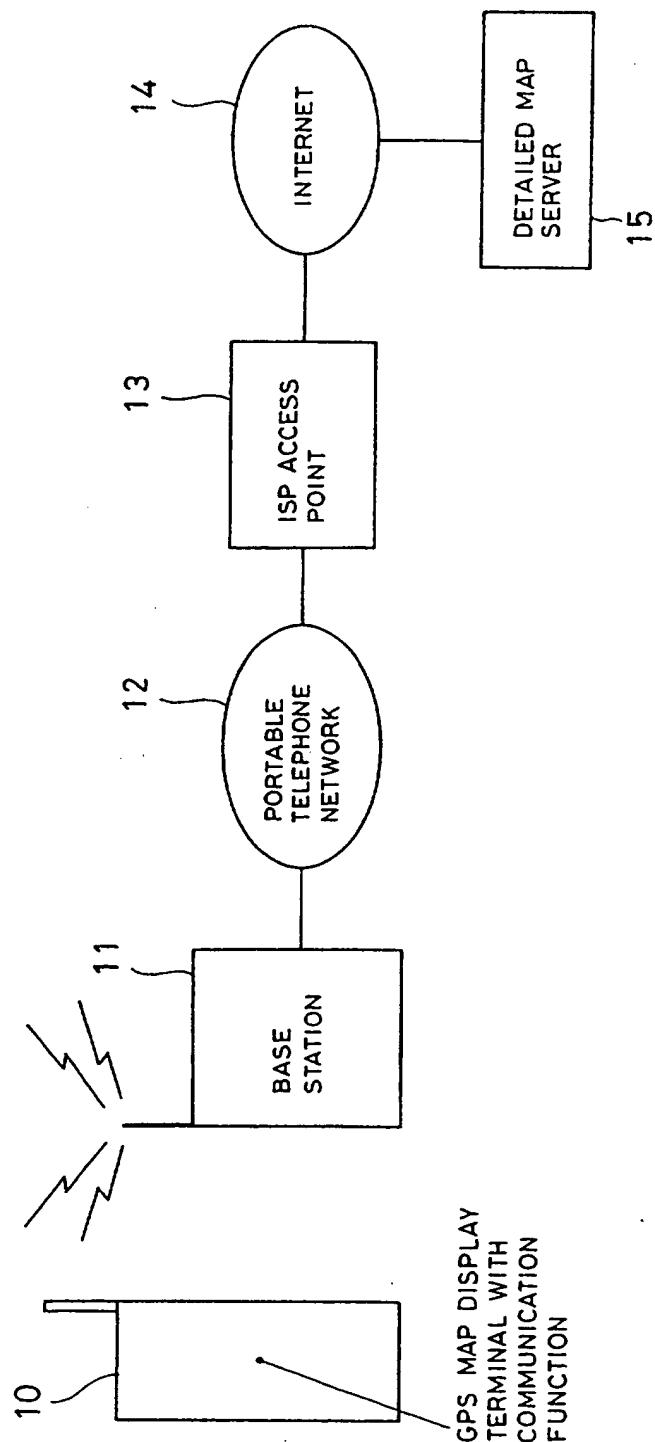


FIG. 5

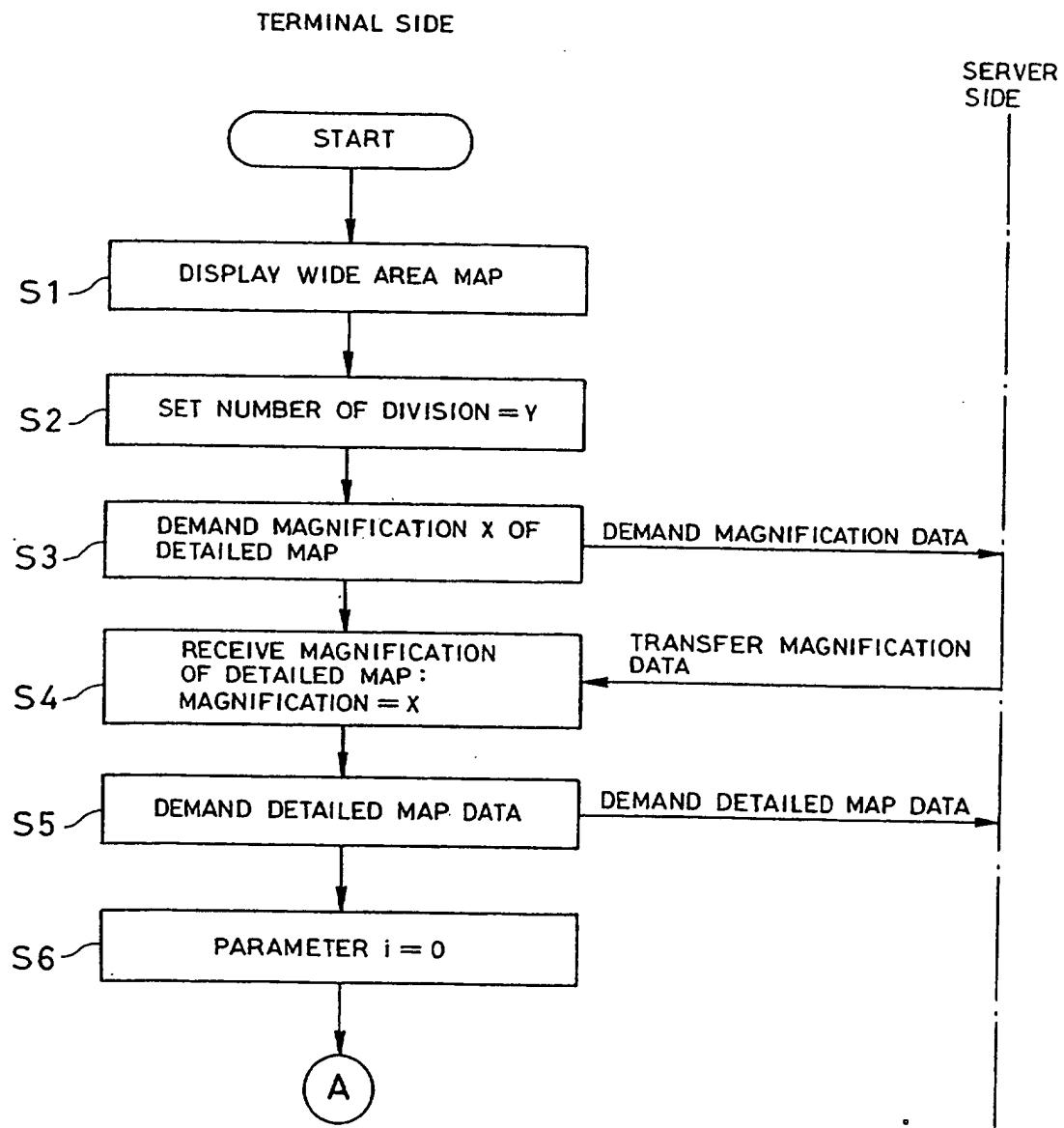


FIG. 6

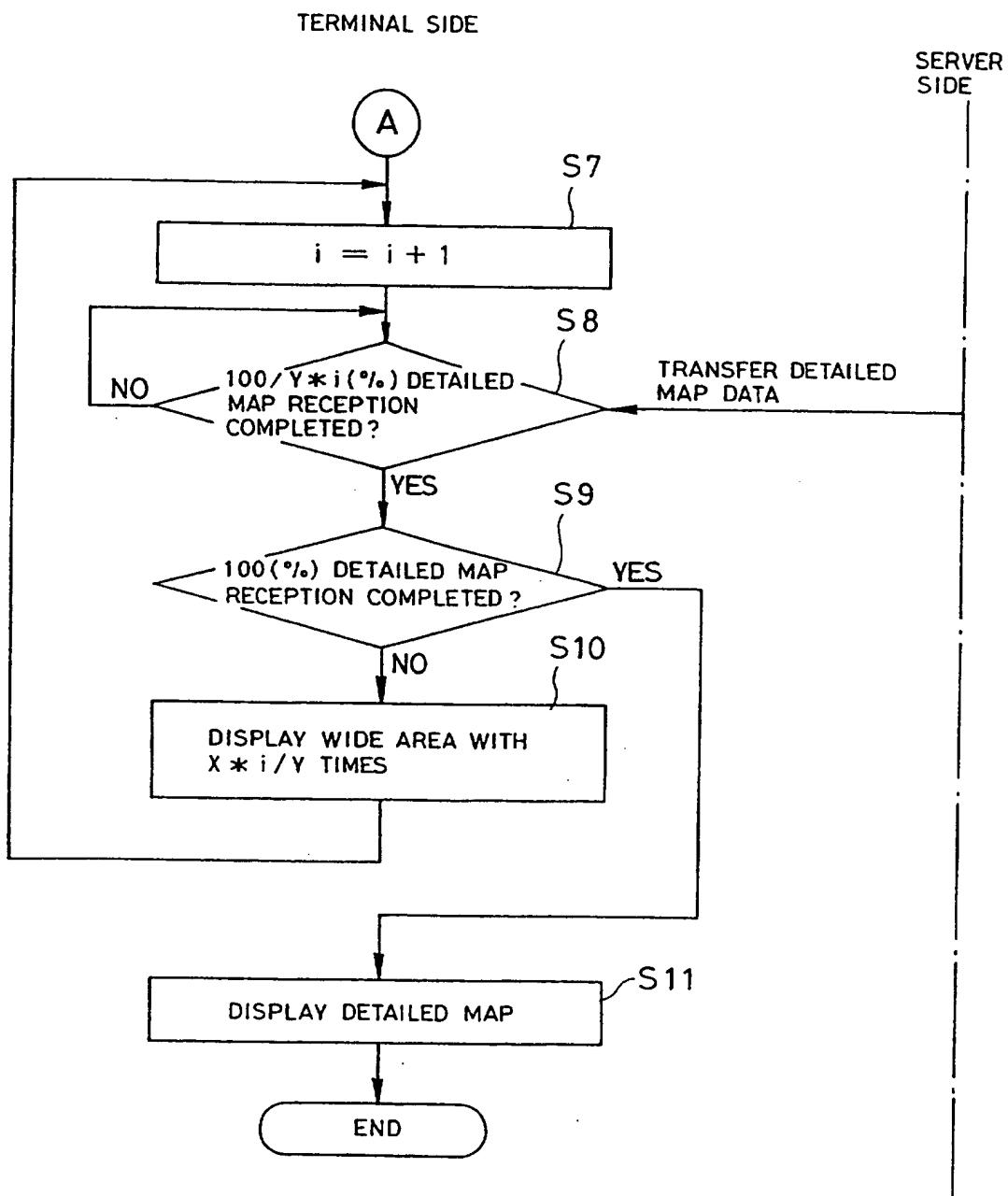
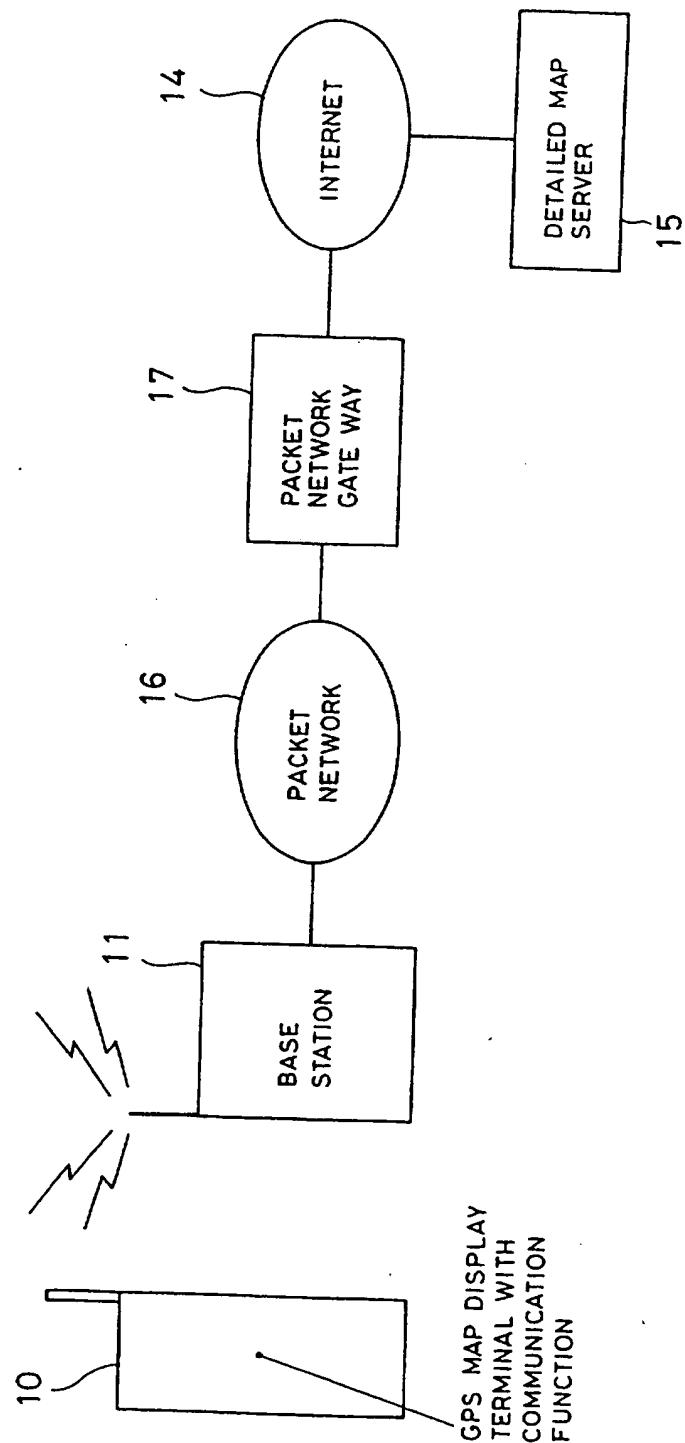


FIG. 7



## MAP DISPLAY TERMINAL AND DISPLAY METHOD

The present invention relates to a map display terminal and a map display method. A particular map display terminal and method to be described below, by way of example in illustration of the invention, is concerned with a map corresponding to a current position on the basis of 5 current position information.

In recent years, apparatus for displaying a current position utilizing a Global Positioning System (GPS) technology has been widely used, primarily for vehicular navigation systems. In such apparatus, map data to be displayed is stored in a storage medium, such as a CD-ROM, or the 10 like, so as to enable a corresponding map to be displayed on the basis of current position information obtained by a GPS.

In addition to its application to vehicular navigation systems, a handy type map display terminal has been put into use. Since these apparatus are required to be portable, they are compact and it is 15 impossible to store in them all of the map data, the amount of which is huge. Therefore, these apparatus are designed to download the necessary map data by means of a communication means.

An advantage of a system in which map data are on a map server in a network and are downloaded as required is that the latest map data 20 can always be provided, and a user may always obtain the latest map data. It is also possible to distribute real-time information, such as traffic information or the like by embedding it in the map data.

In the case of a handy type map display terminal as mentioned

above, in which the map data is downloaded, the portability of such a type of map display terminal makes it necessary for the display area to be narrow, which causes difficulty in displaying information relating to a destination and facilities, such as a railway station, an intersection and so forth, which are landmarks, in one picture frame. Therefore, when a map is displayed taking the destination (current position) at the centre of a display, difficulty is encountered, in depicting the relationship to the periphery of the map.

On the other hand, in the case of a handy type map display terminal, as mentioned above, the user may not be able to check the progress of the downloading until the completion of the downloading of the map data.

Features of arrangements to be described below, by way of example in illustration of the present invention, are that the detection of the relationship between the destination (current position) and the peripheral condition is made easier, even when a detailed map is to be displayed on the narrow display area, and that the progress of the downloading of the detailed map information can be checked.

A particular map display terminal for displaying a current position on a map by deriving a current position on the basis of positional information from a satellite, to be described below by way of example in illustration of the invention, includes first means for displaying a wide area map having a smaller reduced scale than a detailed map and centred at the current position, upon displaying the detailed map centred at the current position.

In a preferred arrangement, a map display terminal further includes second means for displaying the initially displayed wide area map with expansion in a step-by-step manner until the detailed map is displayed. The second means may include means for downloading

5 detailed map information from a server storing the detailed map information.

The map display terminal may be a portable communication terminal. In such a case, communication between the portable communication terminal and the server may be via a portable telephone

10 network. In an alternative, the communication between the portable communication terminal and the server is via a packet network.

The second means may expand the display of the wide area map in a step-by-step manner, depending upon the progress of the download of the detailed map information. The second means may include

15 means for calculating an expansion ratio at each display stage on the basis of a ratio of reduced scales of the wide area map and the detailed map, the number of display stages, and the progress of the downloading.

A particular method for displaying a map of a current position by deriving the current position on the basis of positional information from a

20 satellite, to be described below by way of example in illustration of the invention, includes a first step of displaying a wide area map having a smaller reduced scale than a detailed map and centred at the current position upon displaying the detailed map centred at the current position.

A preferred method further includes a second step of displaying

25 the initially displayed wide area map with expansion in a step-by-step

manner until the detailed map is displayed. The second step may include downloading detailed map information from a server in which the detailed map information is stored. In such a case, communication between the portable communication terminal and the server is performed through a

5      portable telephone network. In the alternative, the communication between the portable communication terminal and the server may be via a packet network. The second step may expand the display of the wide area map in a step-by-step manner, depending upon the progress of the downloading of the detailed map information. The second step may include a step for

10     calculating an expansion ratio at each display stage on the basis of a ratio of reduced scales of the wide area map and the detailed map, the number of display stages, and the progress of the downloading.

A storage medium storing a map display control program for displaying a map of a current position by deriving the current position on

15     the basis of positional information from a satellite will also be described below, by way of example in illustration of the invention, the control program including a first step of displaying a wide area map having a smaller reduced scale than a detailed map and centred at the current position upon displaying the detailed map centred at the current position.

20       The storage medium may further have a control program which provides a second step of displaying the initially displayed wide area map with expansion in a step-by-step manner until the detailed map is displayed.

Namely, a map display method to be described below, by way of

25     example in illustration of the present invention, displays a wide area map

centred at a particular position, such as a destination, a current position or so forth, with expansion in a step-by-step manner, depending upon the progress of the downloading of the detailed map information from the map server.

5           More particularly, in a map display method to be described below, by way of example in illustration of the present invention, when a detailed map (reduced scale: large) is centred at the particular position, e.g. the destination or current position detected by the GPS in response to the demand of the user, a demand for the detailed map data is made to the  
10          map server, and at the same time, the wide area map (reduced scale: small), which is first stored in the terminal, is displayed.

Subsequently, the wide area map is displayed with expansion in a step-by-step manner, depending upon the progress of downloading of the detailed map data. After the completion of the downloading, the detailed  
15          map is displayed.

By this means, even when the detailed map is displayed on a narrow display area, a relationship between the particular position, e.g. destination or current position and the peripheral condition, can easily be seen. Also, the progress of the downloading of the detailed map can easily  
20          also be seen.

Arrangements illustrative of the invention will now be described, by way of example, with reference to the accompanying drawings, in which:-

Fig. 1. is a block schematic circuit diagram,  
Fig. 2 is an illustration of a succession of map displays,  
25          Fig. 3 is an illustration of a wide area map data to be stored in a

ROM shown in Fig. 1,

Fig. 4 is a block schematic diagram showing a map display system,

Fig. 5 is a flowchart illustrating a part of a map display process,

5 Fig. 6 is a flowchart illustrating a part of a map display process,  
and

Fig. 7 is a block schematic diagram showing another map display system.

Referring to Fig. 1, there is shown a map display terminal having a  
10 central processing unit (CPU) 1, a read-only-memory (ROM) 2, a random-access memory (RAM) 3, a communication block 4, a display block 5 and a GPS block 6. CPU 1 provides control of the overall system including the control of the communication block 4, the display block 5 and the GPS block 6 according to programs stored in the ROM 2. The ROM 2 stores  
15 the programs for operating the system and a wide area map data (reduced scale: small). RAM 3 is used as a work area.

The communication block 4 has a modem 41 and a portable radio telephone portion 42 providing means for establishing connection with an internet using a portable telephone network. The display block 5 has an  
20 LCD controller (Liquid Crystal Display Controller) 51 and an LCD 52. The LCD controller 51 carries out data displays, such as a map display or the like, on the LCD 52 under a command from the CPU 1.

The GPS block 6 has a GPS decoder 61 and a GPS radio communication portion 62 for receiving a radio wave broadcast from a  
25 GPS satellite (not shown) and notifying the current position, by means of a

latitude and longitude information, to the CPU 1.

Fig. 2 is an illustration showing the order of a map display in a map display terminal. In Fig. 2, upon displaying a detailed map (reduced scale: large) around a destination (current position measured by GPS) according

- 5 to the demand of the user, the CPU 1 makes a detailed map data demand to a map server from a communication block 4. At the same time, the wide area map (reduced scale: small), which is initially provided in the ROM 2, is displayed by the display block 5.

Subsequently, the CPU 1 expands the display of the wide area

- 10 map in a step-by-step manner according to the progress of the downloading of the detailed map data. Namely, the CPU 1 provides an expanded display of the wide area level 1 map when 33% of the downloading is completed, for example, an expanded display of the wide area level 2 map when 66% of the downloading is completed, and a detailed
- 15 map display when 100% of downloading is completed.

Fig. 3 is an illustration showing the wide area map data which has been stored in the ROM 2 of Fig. 1. Fig. 3 shows that, with latitude and longitude data applied, the wide area map data stored in ROM 2, provides a bitmap format adapting to the size of the display area of the LCD and

- 20 centred at the location identified by the latitude and the longitude data. The map display terminal can alternatively display the map at an arbitrary reduced scale.

Referring to Fig. 4, there is shown a map display system having a GPS map display terminal 10 with a communication function, a base station 11, a portable telephone network 12, an internet service provider

(ISP) an access point 13, an internet 14 and a detailed map server 15.

The GPS map display terminal 10 with the communication function is able to access the internet 14 by establishing a connection with the ISP access point 13 through the base station 11 and the portable telephone network 12. The GPS map display terminal 10 with the communication function has the same construction as the map display terminal shown in Fig. 1.

It should be noted that the base station 11, the portable telephone network 12, the ISP access point 13 and the internet 14 are each of a previously proposed structure, and no detailed description of them will be made.

The detailed map server 15 is a typical web server connected to the internet 14 and is able to transfer the detailed map data or the like in accordance with the HTTP (Hyper Text Transfer Protocol).

The detailed map server 15 holds more detailed map data than the wide area map stored in ROM 2 in the GPS map display terminal 10 having a communication function. The map format of the detailed map is equivalent to that of the wide area map stored in the ROM 2. The detailed map server 15 is responsive to a demand for the detailed map from the GPS map display terminal 10 having the communication function by designating the latitude and the longitude of the arbitrary location, in order to provide a detailed map data centred at the location identified by the latitude and longitude value provided to the GPS map display terminal 10 having the communication function.

In general, a detailed map is necessary in a city and a not so

detailed map is required for example in a mountainous area, or other out-of-city area. Even in the system being described, the reduced scale of the detailed map provided by the detailed map server 15 is different for different areas. Namely, a ratio between the reduced scale of the wide

5 area map stored in the ROM 2 and the reduced scale of the detailed map provided by the detailed map server 15 is also different for different areas.

The detailed map server 15 is responsive to the designation of the latitude and longitude from the GPS map display terminal 10 having the communication function, and a demand for the reduced scale ratio, to

10 provide the ratio of a reduced scale (magnification) between the detailed map data centred at the location identified by the latitude and longitude value and the wide area map data, to the GPS map display terminal 10 having the communication function.

Figs. 5 and 6 are flowcharts showing the method of operation of

15 the map display process carried out in a particular map display system. The map display process will be described with reference to Figs. 1 to 6. The operations necessary for displaying the detailed map centred at the current position on the basis of the GPS position information will be discussed. The process illustrated by Figs. 5 and 6 can be realized by

20 executing the program stored in the ROM 2 by the CPU 1.

At first the CPU 1 of the GPS map display terminal 10 having the communication function provides a wide area map display centred at the current position on the basis of the GPS position information (latitude, longitude) (step 51 of Fig. 5). Here, the wide area map data stored in the

25 ROM 2 is displayed as it is without expansion (magnification of 1).

The CPU 1 sets the number of any division (number of steps upon performing an expanded display) to a parameter Y (step S2 of Fig. 5). In the case of the example of the map display shown in Fig. 2, the wide area map is displayed with progressive step-by-step expansion, at a time at

5 which the progress of the downloading is 33% and at a time at which the progress of downloading is 66%, and at a time at which the progress of downloading is 100%.

In order to carry out the three steps of an expanding the display from the initial wide area map display, the number of divisions in this case  
10 is three. For example, in a case in which the number of divisions is four, the map display will be updated at the time at which the progress of downloading reaches 25%, 50%, 75% and 100%. The number of divisions may be set by the user.

The CPU 1 requires a magnification X of the reduced scale of the  
15 corresponding detailed map data with respect to the wide area data on the basis of the latitude and longitude data given to the detailed map server 15 (step S3 of Fig. 5), and sets a magnification value obtained from the detailed map server 15 to a parameter X (step S4 of Fig. 5). In this arrangement, the magnification means the ratio between the reduced  
20 scales of the wide area map and the detailed map. For instance, when the reduced scale of the wide area map is 1/50000 and the reduced scale of the detailed map is 1/25000, the magnification X is two (2).

After receiving the magnification value, the CPU demands the detailed map data corresponding to the latitude and longitude data with  
25 respect to the detailed map server 15 (step 55 of Fig. 5) and then enters

into the expanded display operation for expanding the wide area map according to the progress of the downloading until the downloading has been completed.

Upon carrying out the expanded display operation, the CPU 1 at

5 first sets a counter parameter 1 to 0 (step S6 of Fig. 5). Next, the counter parameter i is incremented by 1 ( $i = i + 1$ ) (step S7 of Fig. 6).

In this situation, the system enters into the downloading progress waiting state for the detailed map data (step S8 of Fig. 6). For example, in the case in which the number of divisions is three, the judgment of the

10 chart branch is "YES" as the downloading progresses to the stages of progress of 33%, 66% and 100%. HTTP is used for the downloading. In this method, since the size of the file initially transferred is known, the progress can easily be calculated by comparing the transferred file size and the actually downloaded data amount.

15 If the result of the judgment of the condition is "YES", the CPU 1 makes a judgment upon whether the progress of the downloading is 100% or not (step S9 of Fig. 6). If the result of judgment at step S9 is "NO", the wide area map is displayed with expansion at a magnification derived by:

$$X * i / Y$$

20 (step S10 of Fig. 6). For example, when the number of the divisions is three and a ratio of the reduced scale of the detailed map versus the contraction scale of the wide area map is four, the wide area map is expanded to 1.3 times when the downloading progress is 33%, and to 2.6 times when the progress of the downloading reaches 66%.

25 The CPU 1 repeats the procedure from step S7 to step S10 until

the downloading progress becomes 100%. Once, downloading is completed, the detailed map is displayed (step S11 of Fig. 6). Then, the process ends.

As set forth above, by initially displaying the wide area map

5 (reduced scale: small) stored in the ROM 2, even when the detailed map is displayed in a narrow display area, the relationship between the destination (current position) and the peripheral condition can easily be perceived.

On the other hand, by displaying the initially displayed wide area

10 map with progressive expansion in a step-by step manner, depending upon the downloading progress of the detailed map data, the progress of the downloading of the detailed map data can be easily appreciated.

Referring to Fig. 7, there is shown a map display system including a GPS map display terminal 10 having the communication function, a base 15 station 11, a packet network 16, a gateway 17 of the packet network 16, the internet 14 and a detailed map server 15.

In a previously described map display, the internet 14 is accessed by establishing a connection with the ISP access point 13 by means of a circuit connection. A packet switching service utilizing a radio 20 infrastructure for the portable telephone may, on the hand, be used to establish a connection with the internet 14.

In the arrangement of Fig. 7 a connection is established between the packet network 16 and the internet 14 through the packet network gate way 17. In the arrangement shown only the means for accessing the 25 internet 14 is modified, and it will be appreciated that the other parts of the

system are similar to those of the previously described arrangement.

On the other hand, while, in the former arrangement of the map display system, the wide area map data is stored in the ROM 2 in the GPS map display terminal 10 having the communication function, it is possible

- 5 to arrange the system in such a way that the wide area map *per se* is downloaded from the detailed map data. In such a case, since map data is not provided in the terminal, further downsizing of the terminal is permitted. However, since the wide area map has to be downloaded initially, it inherently takes a longer period for initially displaying the wide area map.

- 10 Furthermore, while a map display system which employs the bit map format as the data format of the map has been described, a vector system may be employed. The vector system is a data format storing information regarding road, ground profiles, and so forth as aggregates of lines on the basis of coordinate data. A map display method of the present invention may provide an expanded display of a map, and it is not limited to the use of any particular map data format.
- 15

As described above, the map display terminal may be such that, when the current position is displayed on the map, by deriving the current position on the basis of the positional information from a satellite, upon

- 20 displaying the detailed map centred on the current position, a relationship between the destination (current position) and the peripheral condition can easily be seen, even when the detailed map is to be displayed in a narrow display area by displaying the wide area map centred on the current position.

displayed wide area map carried out in a step-by-step manner until the detailed map is displayed, the progress of the downloading of the detailed map can be seen easily.

Although particular arrangements have been described, by way of  
5 example in illustration of the invention, it will be understood that variations and modifications thereof, as well as other arrangements, may be conceived within the scope of the appended claims.

It will be appreciated, for example, that communication may be via other known systems than radio telephone connections or packet switching  
10 networks.

CLAIMS

5     1. A map display terminal for use in displaying a current position on a map, the current position being derived on the basis of positional information obtained from a satellite, including first means for causing a wide area map, which is centred at the current position and which has a smaller or reduced scale than a detailed map, to be displayed, the detailed  
10    map being centred at the current position.

2. A map display terminal as claimed in claim 1, including second means for causing the initially displayed wide area map to be expanded in a step-by-step manner until the detailed map is displayed.

15    3. A map display terminal as claimed in claim 2, wherein the second means includes means for downloading detailed map information from a server storing the detailed map information.

20    4. A map display terminal as claimed in claim 3, which is included in a portable communication terminal.

25    5. A map display terminal as claimed in claim 4, wherein communication between the portable communication terminal and the server is carried out via a network for portable telephones.

6. A map display terminal as claimed in claim 4, wherein communication between the portable communication terminal and the server is carried out via a packet network.

5

7. A map display terminal as claimed in claim 3, wherein the second means expands the display of the wide area map in a step-by-step manner depending upon the progress made in the downloading of the detailed map information.

10

8. A map display terminal as claimed in claim 4, wherein the second means includes means for calculating an expansion ratio at each display stage on the basis of the ratio between the scales of the wide area map and the detailed map, the number of display stages, and the progress of 15 the downloading.

9. A method of displaying a map of a current position in which the current position is derived on the basis of positional information obtained from a satellite, including a first step of displaying a wide area map which is 20 centred at the current position and which has a smaller or reduced scale than a detailed map, the detailed map being centred at the current position.

10. A method as claimed in claim 9, including a second step of displaying

the initially displayed wide area map expanded in a step-by-step manner until the detailed map is displayed.

11. A method as claimed in claim 10, wherein the second step includes  
5 downloading detailed map information from a server in which the detailed map information is stored.

12. A method as claimed in claim 11, wherein the display is in a portable communication terminal and communication between the portable  
10 communication terminal and the server is carried out via a network for portable telephones.

13. A method as claimed in claim 11, wherein communication between the portable communication terminal and the server is carried out via a  
15 packet network.

14. A method as claimed in claim 11, in which in the second step the display of the wide area map is expanded in a step-by-step manner, depending upon the progress in the downloading of the detailed map  
20 information.

15. A method as claimed in claim 14, wherein the second step includes calculating an expansion ratio at each display stage on the basis of a ratio of reduced scales between the wide area map and the detailed map, the

number of display stages, and the progress of the downloading.

16. A storage medium storing a map display control program for displaying a map of a current position by deriving the current position  
5 on the basis of positional information obtained from a satellite, the control program providing a first step of displaying a wide area map having a smaller or reduced scale than a detailed map and centred at the current position the detailed map being centered at the current position.
- 10 17. A storage medium as claimed in claim 16, which includes a control program providing a second step of displaying the initially displayed wide area map which is expanded in a step-by-step manner until the detailed map is displayed.
- 15 18. A map display terminal as claimed in claim 1 substantially as described herein with reference to Figs. 1, Fig. 4 or Fig. 7 of the accompanying drawings.
19. A method as claimed in claim 9 substantially as described herein with  
20 reference to Figs. 2, Fig. 3, Fig. 5 or Fig. 6 of the accompanying drawings.
20. A storage medium as claimed in claim 16 carrying a program substantially as described herein with reference to Figs. 5 or Fig. 6 of the accompanying drawings.



Application No: GB 0019601.4  
Claims searched: All

Examiner: Simon Berry  
Date of search: 5 January 2001

## Patents Act 1977

### Search Report under Section 17

#### Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.S): H4D (DAA, DAB, DPBC, DSDA, DSDB, DSDD, DSDX); H4L (LDPB)

Int Cl (Ed.7): G01C 21/10, 21/36; G01S 1/04, 5/14; G09B 29/10

Other: ONLINE: EPODOC, WPI, JAPIO, INTERNET

#### Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X	GB 2322248 A (FUJITSU LIMITED) See whole document, noting particularly acquisition of map data from remote source (10) in Figure 1.	1,9,16 at least
X	GB 2298539 A (DEEHAN) Portable guidance device. See whole document, especially mention of 'software' (p7, line 37) and page 9, lines 23 to 27.	1,9,16 at least
X	GB 2287535 A (UNIVERSITY OF SURREY) See whole document, especially page 13, lines 13 to 15 and Figure 2. Note 'server' (20).	1,9,16 at least
X	EP 0312361 A1 (SONY CORPORATION) See whole document, especially description in column 3.	1,9,16 at least
X	WO 97/04334 A1 (LOWRANCE ELECTRONICS) See whole document, especially page 13, lines 19 to 30, and page 14, lines 9 to 15.	1,9,16 at least
X	WPI Abstract Accession No. 99-532488 & JP 11230778 (TDK CORP.). See WPI abstract.	1,9 at least

X Document indicating lack of novelty or inventive step	A Document indicating technological background and/or state of the art.
Y Document indicating lack of inventive step if combined with one or more other documents of same category.	P Document published on or after the declared priority date but before the filing date of this invention.
& Member of the same patent family	E Patent document published on or after, but with priority date earlier than, the filing date of this application.



INVESTOR IN PEOPLE

Application No: GB 0019601.4  
Claims searched: All

Examiner: Simon Berry  
Date of search: 5 January 2001

Category	Identity of document and relevant passage	Relevant to claims
X	WPI Abstract Accession No. 98-511043 & JP 10222062 (MATSUSHITA). See WPI abstract.	1,9 at least
X	WPI Abstract Accession No. 96-163029 & JP 8043112 (MATSUSHITA). See WPI abstract.	1,9 at least

X Document indicating lack of novelty or inventive step	A Document indicating technological background and/or state of the art.
Y Document indicating lack of inventive step if combined with one or more other documents of same category.	P Document published on or after the declared priority date but before the filing date of this invention.
& Member of the same patent family	E Patent document published on or after, but with priority date earlier than, the filing date of this application.